

within 3 or 4 days; other cases already described by Naunyn, as diabetes with paradoxical tolerance seem to stand it for a long time. In one case, where I combined the oatmeal with a vegetable diet, the tolerance kept increasing during a period of 3 weeks.

The reluctance with which the carbohydrate treatment was received by the medical profession was principally due to our inability to bring its results in accordance with our theoretical conception of diabetes.

Two theories have been advanced to explain the origin of diabetes. V. Noorden and his school have tried to find its origin in an increased production of sugar exceeding its assimilation and transformation into glycogen. On the other hand Naunyn and his pupils in accordance with the great majority of writers on the subject agreed that the glycosuria was due to the inability of the body tissues to oxidize sugar.

The crucial experiment which to my mind decides the question in favor of Naunyn's view was done by Starling. He transfused a normal heart and the heart of a dog, rendered diabetic by extirpation of the pancreas, with a solution containing glucose. While the normal heart performed its work at the expense of the glucose the diabetic heart failed to oxidize the sugar, showing that the diabetic tissues were unable to take care of the glucose.

During the oatmeal diet large amounts of carbohydrates are poured into the circulation and under their influence the body suddenly seems to regain its power to oxidize glucose.

Numerous attempts to explain this fact from the standpoint of the old established theory have failed. It was assumed that oatmeal starch was split up in the intestines beyond the glucose molecule, and that the products of fermentation so formed were accessible to the diabetic metabolism and still able to exert the influence of the intact molecule on the acetone bodies. All these attempts have failed and it was definitely established that the action of the oatmeal was not specific, and that the effect depended entirely on the form in which the starch was given.

The diabetic organism therefore is able to take care of carbohydrates provided proteid consumption is kept down to the lowest possible level. In accordance with that we find that the carbohydrates cures are only successful as long as nitrogen excretion can be kept down to a low level of about 5 grammes per day. As soon as the nitrogen excretion increases the glycosuria goes up.

A number of facts are in accordance with the view that under certain conditions the diabetic organism can take care of sugar. Diabetic frogs survive the extirpation of the liver for a number of days, and during that time they fail to excrete any glucose in the urine. Geese after extirpation of the pancreas develop diabetes which, while typical in all its manifestations, shows an increase of glucose in the blood while the urine does not contain any sugar.

It seems to be established that under normal

conditions an intimate relation exists between oxidation of proteids and carbohydrates. It is probably a disturbance in this relation which will be made to account for the inability of the diabetic to oxidize glucose.

To discuss this any further would lead us into the domain of theoretical speculation. What I wanted to do to-day was to bring a number of facts before you to demonstrate what a valuable asset we possess in the carbohydrate cure, and to show in which cases and under what conditions it could be used to advantage.

#### THE EFFECT OF A MOMENTARY CONTACT WITH AN 18,000 VOLT CURRENT.

By PHILIP KING BROWN, M. D., San Francisco.

C. S. Y. Age 30. F. H. negative. Freight conductor on S. P. R. R. Past history and discussion of similar accidents, negative. Always strong. Tub. glands in l. neck removed 12 years ago but never inconvenienced him.

Present trouble. On Jan. 7th at 2 p. m. he was standing on iron ratchet platform at one end of freight car 2 feet below top of car. The train was moving about six miles an hour, and the patient was holding on to the brake-wheel, his hands covered with extra heavy Napatan leather mitts without rivets. The patient knows nothing of what happened and recalls now nothing of pain or sensation of any kind except a momentary hissing, sputtering noise. Later he learned that he was struck in passing by a live electric wire carrying 18,000 volts. The contact was necessarily instantaneous. The wire was not broken, but patient says he understands it was temporarily suspended where it was. He evidently fell to the ground but was unconscious of anything, and does not remember losing consciousness or the fall in any way, although he fell nearly 30 feet. Four hours later he began to be conscious of surroundings, and remembers the pain of a needle used to suture the left ear which was badly torn in the fall.

The patient must have fallen free of the moving train, but no one saw him fall and he does not know where he struck. The only evidences of bruises were the torn ear, soreness of left shoulder, skin off right elbow and two knuckles of left hand and over left ulnar prominence. Besides this there were circular burns an inch in diameter at the hair line on left frontal region, on the plantar surface of left big toe, a smaller burn on the under surface of the adjoining toe at the tip and still others at the base of the little toe of same foot on the outer side and on the plantar surface of the foot two inches from burn on little toe. The woolen cap, shoe and woolen sock were similarly burned. The use of the left arm and leg was impaired but patient thought it due to fall and did not mention it for two days. The arm and leg felt sore and heavy and he had to be assisted in getting his clothes on. The hand was all right but shoulder could not be lifted or hand flexed and extended. The leg was less affected and when he walked slowly it seemed all right. In hurrying or climbing stairs it feels heavy and is moved slowly.

Improvement in use of left arm and leg has been very slight so that present condition May 1st

is little better than when first injured. Can extend and flex left wrist a little, uses the pectorals slightly better. Cannot rise shoulder at all or move it backwards; no use whatever of biceps, triceps or supinator longus. Can almost open the hand and nearly close it, extend the thumb but not flex it.

Leg. The peroneal group weak. Quadriceps slightly weak. Patient describes the leg as strong but slow. No atrophy. No analgesia or anesthesia. Reflexes equal on both sides, fairly lively. No involvement of cranial nerves. Wound in head began to heal well a week ago. All the burns are deep and sharply defined.

### CONTACT WITH STILL HIGHER TENSION CURRENT.

(Notes of two accidents with similar results given me by manager of a power transmission line.)

Our transmission system amounting to over 300 miles of line carries a pressure of 50,000 volts between lines and about 29,000 volts between any one line and ground. It is an alternating current of 60 cycles. A party of three men, one a man about 50 and his son about 18 years old, and an engineer were surveying a parcel of ground which extended under our power line. They were using a metal tape which is commonly known as a surveyor's chain 650 ft. long. The elderly man held one end and the son and engineer the other. The elderly man carried the zero end of the chain ahead of the party to the next stake in the line of their measurement. This course led him under the power line at nearly right angles to it, and beyond a considerable distance. The character of the ground was such that when he reached the stake from which the measurement was to be taken, he had passed out of sight of the power line and in his interest in the work in hand I think it is doubtful if he had in mind the existence of the power line in that particular neighborhood. When he arrived at the stake the engineer and the boy pulled the tape back in their endeavor to pull it taut and to make the proper measurements. The steel tape must have caught on a piece of sage brush and when they gave it a jerk to free it, the tape flipped up and came in momentary contact with one of the wires of our power line. All three parties at that time had hold of the tape and instantly came in circuit between the line and the ground and were subjected to the voltage between the line and the ground. This particular line was protected by an automatic circuit breaker at its junction with the main line. This circuit breaker tripped out when the accident happened, hence there was only a fraction of a second after the tape came in contact with the line that the line was alive.

However, before the line tripped out, sufficient time elapsed to give all three of the men quite severe burns. The engineer and the boy were unconscious for about 10 minutes as far as they could judge, but upon regaining consciousness were able to pick themselves up and go to the assistance of the old man. Fortunately for these men the ground in this vicinity was very dry and formed a very poor grounding. Their recollections of being in the circuit were not clear, and it is doubtful if they had any realization of what hit them. The condition of the older man was much more serious than that of the two younger men, but he states that he did not lose consciousness and that his impression was that he was in the midst of a ball of fire and that fire was all about him and that he heard a great roar. The current passed through or over his body causing him to fall sidewise and it was found he had a severe burn on his side just above the hip. The shock

paralyzed his arms and lower limbs for 2 or 3 weeks. The accident occurred in the latter part of August and the sun was shining very hotly at the time, and he suffered greatly, not from the pain caused by the burns but from the intense heat of the sun. He did not lose consciousness while he lay on the ground and was able by moving his shoulders and head to twist himself around in such a position that his head was brought in the shade of a bunch of sagebrush which gave him some protection from the sun.

The engineer did not realize that he was burned and walked around for three or four days before he was forced to take to his bed on account of the burns on his feet. At that time he discovered he had a severe burn on the bottom of each of his heels about the size of a dollar which forced him to stay at home for nearly two weeks. The boy was also burned on his hands and feet and it must have been a month before he was able to be around. The older man was burned very severely on both his hands and feet, besides a nasty burn on his side. For a week or two he was unable to keep anything on his stomach. I do not know whether this was due to the burn on his side or his general condition. Neither he nor his son came to town to receive the assistance of a physician in spite of the fact that they had been told to do so, but remained at home and received such care and attention as the wife and mother was able to give them with the simple remedies which she had. Later, the engineer, whose brother was a doctor in Tonopah, sent them some medicine. The boy and the engineer have apparently entirely recovered from their burns, but the older man is crippled in the hands from contraction of the tendons, and it is my opinion that he will always be so. I am not sure whether or not the burns are entirely healed, but it is my impression that they are not, particularly on the feet.

Evidently at the time of the accident there was some perspiration on the hands and wrists of the older man as his wrists looked as though they had been subjected to a hot flame. Evidently there must have been an arc which was more intense where there was moisture on the skin. It is my opinion that these people were not very severely shocked but that the high voltage caused the current to pass over their bodies to ground instead of through their tissues and nervous system. This, I believe, is the general theory regarding high voltage; that is, it burns instead of producing a shock.

Another experience that came to my attention during the past winter was at a pumping station here in Goldfield where one of the Water Company's men, while working at the well, carelessly brought an iron pipe in contact with the 6600-volt circuit. Unlike the high tension power line this circuit is not supposed to be grounded, yet when this man brought the pipe which he was carrying in contact with one of the 6600-volt lines he was instantly killed. There was scarcely a mark to be found on his body in the shape of a burn. My idea of this casualty was that the man was shocked to death. In all probability the heart was paralyzed, so that lower voltages ranging up from 1100 up to 6600 volts apparently affect the nervous system in such a manner that death usually follows, but with the higher voltages those coming in contact with the line are severely burned but not so severely shocked.

The other day at our substation one of our attendants carelessly raised up while he was working and came in contact with the 6600-volt circuit on the fleshy part of his hip. He did not lose consciousness or even lose his head but realized what he had done. The shock caused the muscles of his legs to contract suddenly which brought him down on his haunches and thus broke the arc; not, however, until a blister had been made on the skin.